DOCUMENT RESUME

ED 299 594 CS 506 317

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TITLE	Reasoning by Argumentation. Social Studies Learning Milestone 4.
INSTITUTION	Pittsburgh Univ., Pa. Learning Research and Development Center.
SPONS AGENCY	Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE	87
NOTE	26p.
PUB TYPE	Reports - Research/Technical (143) -- Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Abstract Reasoning; College Students; *Critical Thinking; Elementary Secondary Education; Higher Education; *Persuasive Discourse; Psychological Studies; Social Studies; *Teaching Methods
IDENTIFIERS	Justification (Psychology); Students as Subjects

ABSTRACT

This paper is concerned with the importance of argumentation in the classroom, especially in relation to the social sciences. Issues of argument and argument evaluation are considered. The paper analyzes the nature of such reasoning and indicates its importance in subject matter learning. Three situations are described in the paper in which argument-based reasoning is central in support of conclusions and also in the testing of explanations and the weighing of alternatives in decision tasks. Two experiments, designed to determine whether an individual's agreement or disagreement with a particular assertion is related to the reasons the individual is able to generate for and against the particular proposition, are described and explained in the paper's longest section. Following this, justification of an explanation, another way in which argumentation is found in the classroom, is also more briefly assessed. The paper concludes that utilization of a person's knowledge in the context of argumentation constitutes a reasonable instructional objective. (Twenty-six references are appended.) (MS)

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James F. Voss

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To appear in H. Mandl (Ed.), Learning and instruction, Vol. II. London: Plenum.

Reasoning by Argumentation[1]

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The importance of reasoning as a mental activity has been recognized for centuries. Yet, despite its centrality, research on reasoning within psychology per se as well as within the psychology of instruction has been limited. In particular, psychological research on reasoning has been concerned primarily with questions involving a person's ability to think "logically" or "rationally," a preoccupation which perhaps may be traced to a need on the part of humans to show that mankind is indeed "rational" (a false hope in this writer's opinion, except in the relatively simple sense of instrumental rationality). The concern with rational thinking, moreover, may be found in such diverse conceptualizations as nineteenth century faculty psychology and modern decision theory.

Given the preoccupation with the possible logical nature of human thought, it is no surprise that research on reasoning has largely been conducted in the context of tasks based upon the structures of formal logic (cf. Mayer, 1983). Thus, much research has consisted of determining whether individuals judged the validity of syllogisms in accordance with the rules of formal logic and, if they did not, then the question has been to determine why the performance deviated from the norm, i.e., the rules of the syllogism (cf. Henle, 1962). More recently the structures of propositional logic have been employed, with the same two questions being addressed, i.e., whether performance conforms to the rules of propositional logic and why performance deviates from the rules, if it does. Research involving the four card problem (Wason & Johnson-Laird, 1972) has been the most popular example of such tasks. Finally, research by Kahneman and Tversky (cf. Kahneman, Tversky, & Slovic, 1982) involving the neglect of base rates has

followed the same pattern with the Bayesian model serving as the standard.

While the research on reasoning in the context of the more formal tasks has led to significant theoretical developments (e.g., Johnson-Laird, 1983), the work nevertheless touches upon only a relatively small component of what people do when they "reason." In fact, it has been deductive reasoning that has been studied while most reasoning is inductive. Indeed, even Sherlock Holmes' skill of deduction was largely induction. Furthermore, by using formal reasoning tasks, the research has tended to focus upon relatively superficial laboratory situations in which the role of the individual's real world knowledge has played a relatively small role, although such knowledge has been shown to be an important factor when performance deviates from the "rational" norm (e.g., Cheng & Holyoak, 1985).

While the preponderance of research on reasoning has involved the use of formal reasoning tasks, in recent years there has been an increasing tendency to employ tasks involving induction. Examples of such work include research on hypothesis development (Klahr & Dunbar, in press), analogy (e.g., Gentner & Gentner, 1983), induction (Holland, Holyoak, Nisbett, & Thagard, 1986), and causation (e.g., Einhorn & Hogarth, 1986). Future research, which presumably will involve the continued study of inductive forms of reasoning taking place in a variety of task situations, (e.g., Lave, Murtaugh, de la Rocha, 1984; Scribner, 1984) should provide for interesting developments in our understanding of the processes of such modes of informal reasoning.

But what about the study of reasoning in the classroom? In the last decade a considerable amount of interest has been generated in what usually is termed *critical thinking skills* or *critical reasoning*, the primary issue being how to teach such

skills. Programs have been designed to accomplish this objective, and while the evaluation and effectiveness of such programs may in many cases be questioned (see Resnick, in press), within the present context the important point is that such procedures do not generally provide for an analysis of the processes involved in the various types of reasoning. Instead, "critical reasoning" is often defined in terms of a number of presumably component skills, and performance on the skills is studied within an intervention design.

While in recent years instructional interest in reasoning has tended to focus upon "critical thinking" skills, there nevertheless has been an increasing interest in studying reasoning as it takes place in various subject matter domains. Such work includes research on students' reasoning in economics (e.g., Pontecorvo, 1985; Voss, Blais, Means, Greene, & Ahwesh, 1986), in mathematics (e.g., Schoenfeld, 1983), and in physics (e.g., di Sessa, 1982). In addition, there has been work on how individuals with little schooling are able to sell lottery tickets in the relatively complex lottery system of Brazil (Carraher, Carraher, & Schliemann, 1985). Assuming these research trends continue, a better understanding of reasoning in the context of various subject matter domains should be developed, with such advancement also leading to instructional improvements which maximize reasoning effectiveness both in and out of the classroom.

The present paper is concerned with a form of reasoning as it occurs in a number of classroom situations, namely, reasoning that involves argumentation. Three situations are described in which argument-based reasoning is central, namely, in the support of conclusions and, more briefly, in the testing of explanations and the weighting of alternatives in decision tasks. The objective of the paper is thus to call attention to a particular facet of reasoning that has generally been neglected, namely, reasoning by

argumentation, to consider the nature of such reasoning, and to indicate the importance of such reasoning in subject matter learning, especially in relation to social sciences.

Argumentation

The Concept of Argument

The primary unit of logical analysis is the argument (Angell, 1964; Salmon, 1984). An argument typically consists of a single conclusion and one or more premises or reasons. Arguments may be deductive as well as inductive. The syllogism is an example of course of a deductive argument, consisting of two premises and a conclusion, while structures of propositional logic, also deductive, may have an indefinite number of premises and a conclusion. Inductive arguments also contain premises and a conclusion, with the premises stated in a way such that one may infer or support a conclusion. While the terms *premises* and *reasons* may be used interchangeably, it is intuitively more satisfying to use *premises* when the statements are leading to a conclusion and *reasons* when the statements are used to support a conclusion.

As an example of an inductive argument, assume you see a boy, John, walking on the street with a book under his arm. You observe, "John is carrying a book under his arm. John therefore must be going to school." The statement constitutes what Aristotle (1960) termed an ethymeme, i.e., an argument with a missing premise. In this case the missing premise may be, "John usually carries a book when he goes to school."

How should such an argument be evaluated? The evaluation of deductive arguments takes place by determining whether the conclusion follows from the premises according to the rules of the logical structure. Thus, the syllogism may be placed in

logical form, "All A are B," "Some B are C," and, therefore, "Some A are C," and examined to determine whether the syllogism conforms to the rules of the logical structure. In the case of induction, however, while inductive arguments may be placed into a structured form, evaluation of the argument requires consideration of the contents of the argument. Specifically, evaluation of an inductive argument is stated in terms of soundness, and soundness requires consideration of three questions (Angell, 1964). First, is the reason acceptable or true? Second, does the reason support the conclusion? Third, and the most difficult, is all evidence taken into account that supports the contradiction of the conclusion? With respect to the argument about John going to school, evidence that contradicts the argument may be available in the form of the time of day, the time of year, and the day of the week. For example, if it is Saturday, the following argument may be offered: "Today is Saturday. Therefore John is not going to school." Also, if there is a library a block away in the direction John is walking, one may state, "John is carrying a book under his arm. John therefore is going to the library." These two examples are thus counterarguments which support the contradiction of the original argument.

An important facet of inductive argument evaluation is that soundness judgments may vary as a function of the individual, an observation which underscores the idea that determining argument soundness is a judgmental process. Assume a person states, "The most important factor in learning is motivation," and in support states, "Children who achieve good grades are highly motivated." On the other hand, another person may state, "The most important factor in learning is having requisite skills," and support is provided by stating, "Evidence shows that students having trouble learning usually do not have the requisite skills." It would be expected that a person holding the latter

position may rate the original argument involving motivation as less sound than the rating provided by the individual stating the original argument.

The examples provided in this section raise a number of questions, some of which are considered in this paper. For example, how do individuals generate reasons that are used to support conclusions? What types of reasons may be generated, i.e., is there a taxonomy of reasons and, if so, are some types of reasons better than others with respect to the soundness they provide? Does a person's agreement or disagreement with particular conclusions influence the reasons that the individual generates? What is the relation of the person's beliefs to judgments of soundness, i.e., are a person's soundness judgments influenced by the extent to which the individual agrees or disagrees with the conclusions? Having now briefly considered the issues of argument and argument evaluation, we turn to three types of arguments that are especially germane to the classroom.

Three Contexts of Argumentation

Justification in the Classroom. Considering social science instruction, there are a large number of conclusions which may be stated with or without support. For example, one may assert, "The American westward expansion in the nineteenth century was due largely to factors X, Y, and Z." "The primary causes of the Panic of 1837 were X and Y." "The Industrial Revolution had the following effects." Other conclusions may be stated with respect to individuals, for example, "Thomas Jefferson's position on slavery was complex." "Harry Truman's presidency was marked by the need to make difficult decisions." Other conclusions may be stated in relation to government policy: "The policies of the Reagan Administration produced a large increase in the Federal

deficit." While it may not seem like it, another type of conclusion found in the study of history is the factual statement. For example, "Columbus discovered America in 1492" is taken to be a fact. But how do we know? The reasons that would provide support involve accounts which date the voyage of Columbus as well as provide a record of the locations where he landed. Interestingly, a person could conceivably reinterpret the records and conclude that the account is in error and that the date is wrong. More likely, other records could provide a counterargument which indicates that America was discovered not by Columbus but by Vikings. Indeed, the fact that civilizations existed in North America at the time of the Vikings depicts a cultural bias that North America was not "discovered" until it was "discovered" by Europeans. Thus, even historical "facts" are conclusions based upon some type of support. Finally, conclusions may also be stated as conditional propositions, as, "If Mondale had been elected President, the Federal deficit would have increased less than it did with Reagan's election."

Interestingly, history texts used in the classrooms of American schools often state the conclusions without providing the supportive reasons and without stating possible counterarguments. Textbook writers of course face a cost/benefit analysis with respect to what to include or not include in a text, and the result usually produces a necessary over-simplification of historical accounts. However, writing in this way, as necessary as it may be, may provide the student with an inappropriate sense of history, the student thinking that history is simply "facts." In other words, the student may actually be missing the whole point of the importance of argumentation that has led to the "facts." Moreover, if this perspective is accurate, then an important question that arises is how students are going to learn to reason in relation to the subject matter of history. Moreover, even causal explanations can be learned as facts if students do not learn why a

given set of causal conditions produced a particular outcome.

It seems reasonable to assert that a goal of social science education is to have individuals develop an ability to generate and evaluate arguments in relation to subject matter. If so, then experience in such reasoning must be provided via the text, teacher assignments, and/or peer interaction, with the latter two avenues indeed appearing the more likely. Moreover, it is important to emphasize that providing an opportunity to generate, justify, and evaluate conclusions needs to be done in the context of subject matter. Interestingly, Aristotle (1960) pointed out that if one is going to use the tools of rhetoric, the first thing to remember is that the individual needs to have extensive knowledge of the issues in question. The role of knowledge, in other words, cannot be overestimated.

How may instruction provide the student with experience in argumentation? Probably the most obvious ways are by the teacher's own modeling of the behavior, by questioning students about the contents of the course, and by requiring the students to support their answers. Furthermore, the student could also be provided with the opportunity to evaluate the arguments of others. (It would indeed be interesting if students were a little less constrained in being able to ask teachers to justify particular statements.)

Some Questions Concerning Justification. Turning now to some of the previously raised issues, consider the questions "Are there particular types of justification?" and, "If there are different types, then are some types better than others in justifying conclusions?"

The answer to the first question is that there are of course various types of

justification. Some of the more common types are an appeal to authority, to a particular personal experience, to a "truism" or commonly accepted belief, to a principle, to a fact, to a moral principle, or to a consequent of the conclusion. As to whether there are some forms of reasons that are better than others, it generally is thought, at least by intellectuals, that appeals to verifiable evidence and/or to theoretical principle are superior to such types of support as personal example or possibly some "truism." Interestingly, this pro-intellectual bias seems to have some justification because, in general, support via personal example may be more easily attacked by counterargument than support provided by factual evidence or theory.

While some types of reasons may produce greater levels of judged soundness, the issue becomes more complicated when we realize that judging soundness places one squarely in the realm of rhetoric. Specifically, the types of reasons that have the greatest effects are indeed a function of the argument's context. The effect of the arguments will depend upon the objectives of the speaker or writer, upon the audience, and upon the argument itself. Indeed, Aristotle pointed out that non-intellectuals are often better orators in influencing crowds because they argue from examples to which the crowd can relate. Intellectuals, on the other hand, tend to be abstract, dealing with principles, and tend to be relatively ineffective. Furthermore, one of Aristotle's most interesting contributions in relation to argument support is his delineation of *topei*. Basically, the topei or places consist of lines of argument that may be used to support conclusions, and particular ones are more effective in certain situations with specific audiences. Thus, as indicated, whether some types of support tend to yield a higher level of argument soundness is often a function of contextual factors.

Another question, which may seem trivial but which in fact has considerable

theoretical implication, is: "Are individuals actually able to justify their beliefs?" Intuitively one would think that a person could readily justify his or her beliefs, but the question is clearly empirical.

We have recently conducted two experiments designed to determine whether an individual's agreement or disagreement with a particular assertion is related to what reasons the individual is able to generate for and against the particular proposition. We initially asked each individual to indicate his or her extent of agreement or disagreement with respect to each of a series of forty statements. This task was accomplished via use of a rating scale, i.e., the individual indicated whether he or she strongly agreed, somewhat agreed, somewhat disagreed, or strongly disagreed with a particular statement. Subsequently, each statement was again presented and the individuals were asked to generate all the reasons for and all of the reasons against the assertion that the individual was able to think of. In addition, individuals rated each of the reasons on a 1 to 10 scale for their strength, i.e., the strength in support of each pro reason and strength in opposition to the statement for con reasons. This design thus provided for delineating a number of reasoning measures as well as for determining a person's belief about each of the forty propositions. Given these data, it was then possible to correlate one's beliefs with each of the reasoning measures.

The reasoning measures we employed consisted of four sets, with each set having three components. One set was the number of pro reasons stated, the number of con reasons stated, and the number of pro reasons minus the number of con reasons. A second set consisted of the mean weighting of the pro reasons, mean weighting of the con reasons, and the difference of the two mean weightings. A third set consisted of the total weighting of the pro reasons, the total weighting of the con reasons, and the difference of

the total weightings. The fourth set consisted of the strongest pro reason, the strongest con reason, and the difference between the two. As one would expect, these twelve measures were to some extent intercorrelated, with a tendency shown that while pro reasons were correlated with each other and con reasons were correlated with each other, the pro minus con measures tended to be correlated with the pro but not with the con measures. The pattern of significant correlations, given the intercorrelations of the reasoning measures, was that a relation of belief and reasoning should yield twelve or nearly twelve significant correlations, and the lack of a belief and justification relation should yield no or a few significant correlations. The data then may be interpreted in terms of the proportion of individuals who showed justification congruence and the proportion who did not.

We gathered data for students of sixth, ninth, twelfth grades, as well as college. The sixth grade data were bimodal, indicating that some of the students showed a high level of justification congruence while others did not. Few ninth and twelfth graders showed evidence of justification congruence, while approximately seventy percent of the college students demonstrated congruence. We are in the process of expanding and replicating the study, but basically the data indicate that under the described task conditions, some individuals do and some do not provide justification congruence, or, in other words, some individuals provide reasons which are in agreement with their beliefs but other individuals do not demonstrate such a relationship.

The results, which are essentially exploratory, do suggest that college students are more facile in generating pro and con reasons, a result which in part may be attributed to their presumed greater knowledge concerning the topics involved, although it must be noted that the topics involved everyday issues as well as general issues of history.

College students, of course, may receive more experience in justifying conclusions than they received as elementary or high school students. With respect to the possibility that the college students were a more select population, the elementary and secondary school students were from schools from which the majority of students attend college. Thus, the college population was likely not much different in intellectual ability.

We have conducted another study of a similar nature, using only college students in this case (including some graduate students), using the same design, but adding an additional set of conditions. The statements to be rated in this experiment pertained to the Soviet Union, and prior to the rating of the statements, we obtained measures of the individuals' knowledge of and attitude toward the Soviet Union.

Three points are considered with respect to the results of this study. First, about eighty percent of the individuals showed belief congruence, i.e., a large number of significant correlations were obtained between the agree-disagree ratings and the reasoning measures, a result consistent with that found for the college students in the other study that was mentioned. Second, attitude served as a significant predictor of beliefs for one-half of the twenty items of the study. These particular items tended to be those suggesting a fear or threat of the Soviet Union based upon Soviet military strength. Items involving Soviet ideology or domestic factors were not significantly predicted by attitude. In addition, knowledge only served as a significant predictor for two items. The third result involves the reasons generated. While there was an average of 21.7 pro reasons and 19.4 con reasons generated per item, a relatively large number of such items were generated only once per item, 13.5 for pro and 13.2 for con reasons. Thus, while there was some commonality in the items generated, the data were marked by a relatively large number of reasons that were idiosyncratically generated. Also, perhaps

somewhat surprisingly, the specific reasons generated did not vary with attitude or with knowledge. However, for individuals generating the same reason for a given item, attitude was related to the weighting given to the particular reason. In other words, for a relatively anti-Soviet item and a reason that was generated by both a person who was more anti-Soviet and by a person who was more pro-Soviet, the former individual rated that pro reason stronger than did the individual who was more pro-Soviet. The same result was not found, however, with respect to con arguments.

The results of this study raise a number of interesting questions regarding the nature of beliefs, their justification, and their origin. Two such points are briefly considered. First, the results suggest that individuals do not necessarily have beliefs well thought out and justified. Instead, one's beliefs, as indicated by the ratings of a proposition, may be inferred from other beliefs, a process that the philosopher Harman (1986) refers to as the *principle of immediacy*. As an example, assume we are asked whether we agree with A. Rather than thinking about pro and cons reasons with respect to our agreement with A, we may consider a belief, B, related to A, and state whether we agree with A according to the consistency of A and B. Thus, we are responding in a way to maintain the cognitive consistency of beliefs rather than to consider the support, or the lack thereof, of specific beliefs. Using the Soviet Union as a reference, if we agree with the statement, "The Soviet Union would have invaded Western Europe sometime between the end of World War II and the present had it not been for the existence of nuclear weapons," the agreement may have been based upon a belief that the Soviet Union wants control of Western Europe and would use military force to do it. However, we may never have considered pro and con reasons which could be raised with respect to the presumed Soviet desire for control. The point then is that the extent to which a

person actually attempts to justify his or her own beliefs is open to question.

We would also note that if asked, a person could point to the Soviet 1968 invasion of Czechoslovakia and the invasion of Afghanistan and say these acts support an aggressive interpretation of Soviet Union activity and its presumed desire for control. However, the point is whether the individual used the Czechoslovakia and Afghanistan examples to arrive at the conclusion concerning the Soviet desire for control or whether the reasons are used in an a posteriori way to justify the beliefs. Certainly the Nisbett and Wilson (1977) results suggest individuals may employ culturally acceptable reasons to justify one's beliefs and that these reasons may not have been a factor in arriving at the particular conclusion.

The third study which is considered involves the evaluation, rather than generation, of arguments. While the results are preliminary, the questions raised by this work are of interest. Individuals were given a conclusion with a strong pro reason, a weak pro reason, a strong pro reason and a strong con reason, a strong pro reason and a weak con reason, a weak pro reason and a strong con reason, and a weak pro reason and a weak con reason. Forty conclusions were presented, each conclusion occurring in each of the above six conditions. (The materials were previously scaled with respect to the strength of the reasons.) The task was to rate each argument for soundness on a 1 to 5 scale.

The primary purpose of the experiment was to determine how the presence of a strong or weak con reason influenced the soundness judgment. The results indicated that the strong pro reason supporting the conclusion yielded a mean soundness judgment of approximately 3.5, a rating of approximately 3.4 was obtained when the conclusion

and the strong pro reason were presented in the presence of a weak con reason, and a rating of approximately 3.1 when the conclusion and strong pro reason were presented in the presence of a strong con reason. While the overall differences were significant, analysis indicated that a weak con argument does not have much effect upon the soundness rating when the pro reason is strong while a strong con reason has a not-too-great, but significant effect.

The results with respect to the weak pro reason were counter-intuitive. Specifically, the weak pro reason presented by itself yielded a mean soundness judgment of approximately 2.5 while the weak pro reason in the presence of a weak con reason yielded a mean soundness rating of approximately 2.8, and in the presence of a strong con reason yielded a mean soundness rating of approximately 2.7. Statistically, the pro weak reason above yielded a judgment of significantly *lower* soundness than when the reason occurred with either con argument. In other words, the presence of the con reason increased rather than decreased the soundness rating.

The study, while exploratory, does indicate that soundness judgments may be made in relation to arguments and that the judgments are in general agreement with scaled versions of the materials. More importantly, the results indicate that this type of design may be employed to study how soundness ratings take place. We plan to use the design in further work to study the basis of how individuals make soundness judgments. In summary, the results presented in this section constitute a start in the investigation of conclusion justification and more work is required to provide an account of the mechanics by which the processes of argumentation occur.

The Testing of Explanation

This section briefly considers another way in which argumentation is found in the classroom, namely, in the justification of an explanation. A conclusion serves as an explanation primarily when the explanation is a causal statement, although an explanation need not be causal. Thus, consider a situation in which events have been observed and a person is seeking an explanation for their occurrence. Assume for example that the stock market drops thirty points in a day. It is common for a report to read, "Responding to the government's announcement of . . ., the stock market . . . ," or "Responding to the recent events in the Middle East, the stock market . . . ." In such cases the particular events are presumed to have caused the decline in the stock market. Are such explanations as these, and many others found in various domains, acceptable? And perhaps more importantly in the present context, how do we determine whether such explanations are acceptable?

The answer to the latter question is that we need to consider the explanation as a conclusion and to evaluate the conclusion by the previously described criteria. In the case of the stock market example, if support is not provided for any of the explanations, we may view the conclusion somewhat skeptically as unsupported and, if we wanted to, we could try and evaluate it by generating our own support or counter-evidence. Thus, to support a conclusion that is stated as a causal explanation, one needs to provide support which shows the explanation is acceptable. There must, in other words, be a causal link shown to be the case, although the nature of such a linkage will vary with subject matter. Assume, for example, that one were interested in considering the causes of World War I. One could assert that the cause was the assassination of Archduke

Ferdinand. In order to support this assertion, one needs to show that the assassination produced events which led to the actual beginning of combat. This support would then be evaluated in reference to whether it is acceptable, whether it supports the conclusion, and whether other evidence exists which supports another explanation.

Without getting into a lengthy discussion on the topic of causality, it nevertheless should be mentioned that explanations involving complex issues as the causes of World War I become even more complex because of the need to consider enabling conditions and auxiliary hypotheses. Enabling conditions refer to conditions which exist that are not in themselves causes but which enable the event to take place, e.g., "Marriage is a cause of divorce." In this case marriage is an enabling condition and not, in a sense, a cause. It is a necessary but certainly not a sufficient condition. Indeed, events regarded as causes are usually novel, and testing whether a novel event may be judged as causal requires justification. (See Einhorn and Hogarth (1986) for an interesting discussion of the cues that are used to establish causality.)

Argumentation and Decision Tasks

In considering many issues, an individual is regarded as acting rationally if he or she considers both sides of the question and then arrives at a conclusion based upon such pro and con evaluation. So, in deciding which candidate to vote for, an individual presumably weighs the pros and cons of each candidate and makes the choice of voting for the more desirable candidate, with desirability related to which candidate has the stronger pro and the lesser con reasons of support. (Sometimes of course such decision making may involve selecting the relatively more desirable of two undesirable candidates.)

Perkins, Allen, and Hafner (1983) studied choice behavior in situations similar to the election situation, asking individuals whether there should be a compulsory military draft, whether a state legislature should pass a law requiring many liquids be sold in returnable bottles rather than cans or disposable bottles, and other issues. The results of the research indicate that individuals apparently generate few pro and con reasons, and that the reasons they generate often demonstrate a "my side" bias, i.e., a person generates more reasons for his or her own position then for the opposing or "other side" position. Perkins et al. interpreted their results as showing that individuals tend to have a "make sense epistemology," i.e., reasoning proceeds until an individual's position "makes sense," which usually involves generation of only a few "my side" reasons and fewer "other side" reasons. Individuals do not, in other words, explore all possible reasons and their implications. Another interpretation of these data is that individuals were "satisfycing," i.e., coming up with reasons until they were satisfied with the support (e.g., Simon, 1983).

Perkins (1985) also studied performance on pro and con reason generation tasks for individuals of elementary school, secondary school, and college. He found that while individuals at each respective higher level scored higher on reasoning measures such as the number of reasons generated, the reasoning scores did not change between the beginning and end of the school year. Perkins concluded that while performance tended to yield more reason generation with level of schooling, the schooling itself does not seem to lead to such change.

The results described in the preceding two paragraphs not only raise the question of the extent to which individuals consider pros and cons in the decision process, but they also raise the question of what performance on such tasks is optimal. Within the

context of "rationality," it is believed that individuals should arrive at a decision by considering all available pros and cons to arrive at a "rational" choice. However, a more realistic model may be one based upon a signal detection type of analysis. Specifically, assume that, given a person's prior beliefs, the individual is presented with a conclusion and asked to generate pro and/or con reasons until the idea is accepted or rejected. Assume further that the individual sets a criterion for when a pro or con position is to be adopted. The criterion may include the type and number of reasons generated as well as other factors. Furthermore, the criterion is relative, in the sense of the pros being relatively stronger than the cons or vice-versa. In general, using a "make sense" epistemology, one may require much information to reach the decision. However, for more serious decisions in one's life, the criterion may be more stringent. In the latter case, the number and/or strength of the reasons required to reach a decision is presumed to be greater. This signal detection type of analysis leads to a position similar to what the signal detection analysis implied for psychophysics, namely, that there is no threshold in an absolute sense but that the threshold is a function of sensitivity and response bias. Similarly, in the present case, there is no real "rationality," for the choice is a function of the criterion employed and the reasons generated. This analysis is incomplete, however, for it does not take into account the weighting that the individual ascribes to each of the reasons generated. Such weightings would also be expected to be a function of the person's beliefs and attitudes.

The analysis described above, while quite incomplete, nevertheless points to the complexities involved in an individual looking at "both sides" before making a decision. The complexities also point to the instructional complications in teaching the importance of weighting alternatives.

With respect to argumentation, the weighting of two sides of a proposition involves considering two alternatives, usually mutually exclusive conclusions, and asking the individual to weigh each argument. Often there is no definite final answer, but a person can and often must reach a decision in what is a trade-off situation, a fact of life that could readily be taught in terms of interpretations of a historical event.

Conclusion

This paper had as its objective the "raising of consciousness" concerning the importance of argumentation in the classroom, especially in relation to social sciences. The paper had the additional objective of presenting results concerned with the generation and evaluation of reasons as well as with the relation of such reasoning to one's beliefs. Our findings and those of other investigations suggest that utilization of one's knowledge in the context of argumentation constitutes a reasonable instructional objective.

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Notes

[1]The research of this paper was supported by the Center for the Study of Learning of the Learning Research and Development Center, supported in part as a research and development center by funds from the Office of Educational Research and Improvement (OERI). The opinions expressed do not necessarily reflect the position or policy of any of these organizations. Requests for reprints should be sent to Dr. James F. Voss, University of Pittsburgh, Learning Research and Development Center, 3939 O'Hara Street, Pittsburgh, PA 15260. The research described in this paper was conducted with the assistance of Rebecca Fincher-Kiefer and Laurie Ney.